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**RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2000  
(ROSS-2000)**

NASA Research Announcement  
Soliciting Basic Research Proposals

NRA 00-OSS-01  
Issued: February 9, 2000

Proposals Due  
Starting April 28, 2000,  
and Ending September 15, 2000

Office of Space Science  
National Aeronautics and Space Administration  
Washington, DC 20546-0001

## RESEARCH OPPORTUNITIES IN SPACE SCIENCE - 2000 (ROSS-2000)

The mission of the Space Science Enterprise of the National Aeronautics and Space Administration (NASA) is to solve the mysteries of the universe, to explore the solar system, to discover planets around other stars, and to search for life beyond Earth. To carry out this mission, NASA's Office of Space Science (OSS) sponsors a broad range of research programs relevant to its four Science Themes, which are defined as:

- *Astronomical Search for Origins & Planetary Systems* (ASO) that addresses the origins of galaxies, stars, proto-planetary and extra-solar planetary systems, Earth-like planets, and the origin of life;
- *Solar System Exploration* (abbreviated as ESS) that seeks to understand all aspects of our Solar System, including the planets, satellites, small bodies, and solar system materials, as well as searching for possible habitats of life beyond Earth;
- *Structure & Evolution of the Universe* (SEU) that involves the study of cosmology, the large scale structure of the universe, the evolution of stars and galaxies, including the Milky Way and objects with extreme physical conditions, and an examination of the ultimate limits of gravity and energy in the Universe; and
- *The Sun-Earth Connection* (SEC) that concerns the Sun as a typical star and as the controlling agent of the space environment of the Solar System, especially the Earth.

Stated in an alternative manner, these four themes seek to answer the four fundamental questions: "How did the Universe begin and evolve?" "Where did we come from?" "Where are we going?" and "Are we alone?"

Further information about these themes may be found through the OSS homepage on the World Wide Web at <http://spacescience.nasa.gov>. In addition, this NRA, entitled "*Research Opportunities in Space Science - 2000 (ROSS-2000)*," may be found by opening "*Research Opportunities*" from the menu at this same Web site.

OSS pursues these fundamental science themes using a wide variety of both space flight programs and investigations in basic science and technology. This NASA Research Announcement (NRA) solicits proposals for Supporting Research and Technology (SR&T) investigations that seek to understand natural space phenomena and space science-related technologies across a full range of science subdisciplines relevant to OSS interests. Table 1 of this cover letter lists all the program components solicited by this NRA in the order of their respective due dates for the submission of proposals. As a guide to their relationships, Table 1 also cross references these program components to the OSS Science Themes as noted above. Appendix A contains detailed descriptions of each component, and questions about each may be directed to the respective Discipline Scientists identified in the text for each.

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### IMPORTANT NEW INFORMATION

The Space Science SR&T program consists of nearly forty distinct subdisciplines and programs. Except for programs involving suborbital rockets, balloons, or a Shuttle flight, where flight opportunities are part of an award, the primary resource to be awarded is funding. The relative distribution of funding among these ~40 SR&T programs, as well as the absolute funding awards, have barely changed during the past decade. Advisory groups have urged the OSS to adjust this SR&T program structure, as well as the funding distribution, to better fit today's science interests and enable tomorrow's research directions. In agreement with these recent recommendations, OSS has begun a process of periodic assessments of the entire Space Science SR&T program. As a first step, the nearly 40 distinct programs have been grouped into nine Clusters, which are listed in the table of contents of Appendix A at the end of this summary cover letter and further discussed in the Introduction to Appendix A. They are arranged primarily by science topic and secondarily by function. For Fiscal Years (FY's) 2000 and 2001, the funding allocated to each Cluster will be exactly equal to the sum of previously planned funds for all individual subdisciplines and programs within each Cluster. The Discipline Scientists for each science Cluster are responsible for allocating funding to the individual programs within their Clusters. To enable possible reallocation of funding within a science Cluster, all proposals within each one may be reviewed at, or nearly at, the same time; therefore, the proposal due dates (see Table 1) are also scheduled to be as simultaneous as possible at the time of this NRA.

Beginning in FY 2001, OSS will convene triennial science reviews, so-called "Senior Reviews," of its entire Space Science SR&T program. These SR&T Senior Reviews will address three questions:

1. Is the Cluster structure optimal, or should the structure and/or content be changed?
2. What was the recent science productivity and quality of each of the Clusters, and what is the outlook for the next few years (based on already selected multiple year awards)?
3. Is the funding distribution among the SR&T Clusters commensurate with their science productivity and relevance to the most recent OSS program strategy, or should there be a re-distribution?

Recommendations from the mid-2001 SR&T Science Reviews will be used to help determine Cluster structure and content, as well as funding for FY's 2002-2004 (October 1, 2001, through September 30, 2003). Questions about this evolving approach to the

restructuring and review of the NASA OSS SR&T program may be directed to:

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Research Program Management Division  
Office of Space Science  
Code SR  
NASA Headquarters  
Washington, DC 20546  
Telephone: 202-358-1588  
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Although Table 1 effectively cross-references these newly defined Clusters to many of the traditional ROSS Program Elements and the four OSS Science Themes, the Introduction of Appendix A also provides additional narrative material that expands on these relationships. Therefore, anyone interested in applying to this NRA is urged to read the relevant parts of the Introduction to Appendix A for a full understanding of whether their research interests are relevant to NASA OSS interests, and if so, to which Cluster their proposal should be submitted.

Starting in FY 2001, it is the policy of the Office of Space Science that some portion of the budget of nearly every ongoing research program in this NRA series shall be open for competition for new proposals every year. This is a transition year for this new policy; consult the Cluster(s) of interest for details.

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Appendix B provides the standard NASA guidance for responding to NRA's, and Appendix C provides amendatory guidance to Appendix B for the format and submission requirements for proposals to be submitted to this NRA. Interested proposers should read Appendix C carefully in its entirety before writing their proposals. Special attention is directed to the requirement for the electronic submission of both a Notice of Intent to propose and a combined *Cover Page/Proposal Summary* for the proposal itself.

OSS policy continues to strongly encourage participation by the space science community in education and public outreach activities with the goal of enhancing the formal education system and contributing to the broad public understanding of science. Therefore, proposers to this NRA are encouraged to propose Education/Public Outreach (E/PO) activities that conform to the E/PO guidelines as established by OSS as an addition to any proposal submitted in response to this NRA. The current description of this program appears in Appendix A.10.

Recommendations for funding will be based on the peer evaluation of each proposal's science and technical merits, its relevance to the objectives of the OSS science program element as described in this NRA to which it is submitted, and its requested budget. A

proposed E/PO activity of merit will also be used to discriminate between new proposals of otherwise nominally comparable scientific, programmatic, and financial merits. In all cases, the Government's obligation to make awards is contingent upon the availability of appropriated funds from which payment can be made and upon the receipt of proposals in response to this NRA that NASA determines are acceptable for award.

Participation in this program is open to all categories of U.S. and non-U.S. organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies. Historically Black Colleges and Universities (HBCU's), other minority educational institutions, and small businesses and organizations owned and controlled by socially and economically disadvantaged individuals or women are particularly encouraged to apply.

#### SPECIAL NOTES:

(1) Because this NRA is released far in advance of the deadlines given in Table 1, additional programmatic information for any given entry may develop before proposals are due. If so, such material will be added as an Amendment to this NRA as posted at its Web site no later than 90 days before the proposal deadline. It is the responsibility of the prospective proposer to check this site for updates concerning the Program Element(s) and Cluster(s) of interest.

(2) OSS now requires the electronic submission of certain elements of proposals through the World Wide Web, and this practice continues with this ROSS-2000 NRA. While every effort is made to ensure the reliability and ease of accessibility of these Web sites, and to maintain "help lines" via E-mail and telephone, difficulty in accessing and/or using these sites may arise at any point on the Internet including the user's own equipment. Therefore, prospective proposers are urged to submit required materials well in advance of the deadlines.

(3) NASA Headquarters is in the process of selecting a new consolidated support contractor who will be responsible for receiving all proposals received by all Headquarters program offices that release program solicitations. Because of the timing of this selection and the release of this ROSS-2000 NRA, it is not possible to provide the delivery address for proposals for some of the Clusters in Appendix A. However, this information will be provided as soon as possible by four different ways: First, an E-mail will be sent to every subscriber to the NASA OSS Electronic Notification system (see "*Get Announcements*" through the menu on the OSS homepage at <http://spacescience.nasa.gov>); second, an electronic notification will be sent to all proposers who submits a Notice of Intent (NOI) to propose for that Cluster or program component; third, this information will be posted at the Web site for this NRA, which may be accessed through the menu listing *Research Announcements* at the Web site given above; and fourth, proposers may directly contact either the Discipline Scientist for the program component of interest in Appendix A or the point of contact for general program/policy information listed below in this cover letter.

The following Summary Information applies to this ROSS-2000 NRA:

- Program alpha-numeric identifier: NRA 00-OSS-01
- Date of NRA issue: February 9, 2000
- Notice of Intent (NOI) to propose –
  - Due date: See Table 1 below.
  - Web site for electronic submission: See individual sections of interest in Appendix A and SPECIAL NOTE (3) above.
- Submission of Proposals –
  - Page limits: See Section C.5.2 in Appendix C.
  - Required number: Signed original plus 15 copies (unless otherwise specified in Appendix A).
  - Due date: See Table 1.
  - Address for submission by mail: See individual sections of interest in Appendix A and also SPECIAL NOTE (3) above.
- Selecting Official: Director  
Research Program Management Division
- Announcement of selections: Goal: 150 days after proposal due date.
- Initiation of funding for new awards: Goal: 29 days after proposal selection.
- Further information -
  - Science Program Elements: Discipline Scientists listed in Appendix A.
  - General NRA procedures: Dr. J. David Bohlin  
Code SR  
Office of Space Science  
National Aeronautics and Space  
Administration  
Washington, DC 20546-0001  
Phone: (202) 358-0880  
E-mail: [david.bohlin@hq.nasa.gov](mailto:david.bohlin@hq.nasa.gov)

Finally, note that NASA OSS maintains an electronic notification system to alert interested subscribers of the impending release of its research program announcements. Subscription to this service is accomplished through the OSS home page at <http://spacescience.nasa.gov> , select the menu item *Get Announcements*, and then follow the instructions within the subsection entitled *Space Science Research Announcements*. Owing to the increasingly multidisciplinary nature of OSS programs, this electronic service notifies subscribers of all future NASA OSS program announcements of any type and objective that are released for any of the OSS science themes (anticipated to be 10 to 20 items per year). Regardless of whether this service is used or not, all OSS research announcements may be accessed and downloaded as soon as they are posted (about 8:30 AM Eastern Time on the day of their release) by linking through *Research Opportunities* on this OSS homepage menu.

Your interest and cooperation in responding to this ROSS-2000 NRA are appreciated. Comments about the nature and/or structure of this inclusive NRA for many of the OSS supporting research and analysis programs are welcome. Such comments may be directed to either the Discipline Scientists identified for each program element in Appendix A or to the point of contact for Programmatic policy/procedures identified above.

Alan N. Bunner  
Science Program Director  
Structure and Evolution of the Universe

Carl B. Pilcher  
Science Program Director  
Solar System Exploration

Anne L. Kinney  
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Astronomical Search for Origins  
and Planetary Systems

George L. Withbroe  
Science Program Director  
The Sun-Earth Connection

## APPENDICES

Note: As a departure from previous NRA's in this ROSS series, Appendix A is organized into Clusters instead of the four OSS Science Themes (see discussion above); the relationships of the Clusters and Program Elements to the OSS Science Themes are given in the last four columns Table 1.

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**TABLE 1**  
**SCIENCE PROGRAM ELEMENTS SOLICITED IN THE ROSS-2000 NRA**  
**(in order of the proposal due dates)**

[ASO: Astronomical Search for Origins; SEU: Structure and Evolution of the Universe; ESS: Solar System Exploration; SEC: The Sun-Earth Connection]

Cluster	NRA Appendix	Science Program Element (see Appendix A)	NOI Due Date	Proposal Due Date	Relevant OSS Science Themes			
					ASO	SEU	ESS	SEC
A.5	A.5.1	Planetary Astronomy	3/10/00	4/28/00	X		X	
A.5	A.5.2	Near Earth Object Observations	3/10/00	4/28/00	X		X	
A.5	A.5.3	Planetary Atmospheres	3/10/00	4/28/00			X	
A.5	A.5.4	Planetary Suborbital Research	3/10/00	4/28/00			X	
A.6	A.6.1	Exobiology	3/10/00	4/28/00	X		X	
A.8	A.8.1	X-ray and Gamma-ray Astrophysics	3/10/00	4/28/00		X		
A.8	A.8.2	Cosmic Ray Astrophysics	3/10/00	4/28/00		X		
A.1	A.1.3	Astrophysics Data	3/15/00	5/05/00	X	X	X	
A.1	A.1.4	Long-Term Space Astrophysics	3/15/00	5/05/00	X	X	X	
A.4	A.4.1	Cosmochemistry	3/17/00	5/12/00	X		X	
A.4	A.4.2	Planetary Geology and Geophysics	3/17/00	5/12/00			X	
A.4	A.4.3	Origins of Solar Systems	3/17/00	5/12/00	X		X	
A.4	A.4.4	Mars Data Analysis	3/17/00	5/12/00			X	

**TABLE 1 (continued)**

Cluster	NRA Appendix	Science Program Element (see Appendix A)	NOI Due Date	Proposal Due Date	Relevant OSS Science Themes			
					ASO	SEU	ESS	SEC
A.7	A.7.1	Space Astrophysics Research and Analysis (SARA)*	3/31/00	5/26/00	X	X		
A.1	A.1.2	Sun-Earth Connection Guest Investigator	04/13/00	06/08/00				X
A.3	A.3.1	Geospace Sciences**	5/05/00	7/07/00			X	X
A.1	A.1.5	Astrophysics Theory	5/26/00	7/28/00	X	X		
A.6	A.6.2	Planetary Instrument Definition and Development	6/02/00	8/04/00			X	
A.2	A.2.1	Solar Physics Research, Analysis and Low Cost Access to Space	6/23/00	8/25/00				X
A.2	A.2.2	Heliospheric Physics	6/23/00	8/25/00				X
A.9	A.9.1	Applied Information Systems Research	7/14/00	9/15/00	X	X	X	X

\* The SARA Cluster includes the following Program Elements that were separately identified in previous ROSS NRAs:

- Ultraviolet, Visible, and Gravitational Astrophysics
- Infrared/Submillimeter/Radio/Interferometry Astronomy
- Space Astrophysics Detectors
- Astrophysics Suborbital

\*\* The Geospace Sciences Cluster includes the following Program Elements that were separately identified in previous ROSS NRAs:

- Ionospheric, Thermospheric, and Mesospheric (ITM) Physics
- Magnetosphere Physics
- Magnetospheric and ITM Low Cost Access to Space

## INTRODUCTION AND OVERVIEW

The introductory summary cover letter to this NRA notes that starting with this ROSS-2000 NRA the Office of Space Science (OSS) is beginning to reorganize its research programs into a series of Clusters to allow the eventual consideration of the reallocation of resources in compliance with evolving NASA program priorities and strategy. This Introduction and Overview to Appendix A provides a guide to the contents of this Appendix and the relationship of the Clusters and their program components to the OSS science themes.

I. Sun-Earth Connection

The Sun-Earth Connection (SEC) science theme of NASA's Office of Space Science (OSS) supports investigations of the Sun and planetary space environments, including the origin, evolution, and interactions of space plasmas and electromagnetic fields in the heliosphere and in connection with the galaxy. Understanding the origin and nature of solar activity and its effect on the space environment of the Earth is a particular focus. Current discipline interests are:

*Heliospheric Physics:* the origin and behavior of the solar wind, energetic particles, and magnetic fields in the heliosphere and their interaction with the interstellar medium;

*Solar Physics:* the Sun as a typical dwarf star, and as the dominant, time-varying source of energy, plasma, and energetic particles in the solar system, especially concerning its influence on the Earth;

*Magnetospheric Physics:* the physics of magnetospheres, including their formation and fundamental interactions with plasmas, fields, and particles; the Earth's magnetosphere is emphasized, but studies of the magnetospheres of planets, comets, and other primordial bodies are also supported; and

*Ionospheric, Thermospheric, Mesospheric (ITM) Physics:* the physics of the mesosphere, thermosphere, ionosphere, and aurorae of the Earth, including the coupling of these phenomena to the lower atmosphere and magnetosphere.

The strategic vision for the Sun-Earth Connection is embodied in the Sun-Earth Connection Roadmap - Strategic Planning for the Years 2000-2025 available on line at <http://www.lmsal.com/sec/>. Sun-Earth Connection research program supports several types of endeavors, including Supporting Research and Technology (SR&T) and Low Cost Access to Space (LCAS) programs in the various disciplines, the Sun-Earth Connection Theory Program, as well as Guest Investigator programs. Generic program descriptions follow immediately below, while discipline specific information can be found in the individual SEC program elements.

(1) Supporting Research and Technology (SR&T) Programs support individual research tasks each that employ a variety of research techniques, e.g., theory, numerical simulation, and modeling; analysis and interpretation of space data; development of new instrument concepts; and laboratory measurements of relevant atomic and plasma parameters, all to the extent they have a clear application to Sun-Earth Connection program goals. The solar and heliospheric SR&T programs are administered as part of the Solar and Heliospheric Physics cluster, which is described in Appendix A.2, while the magnetospheric and ITM SR&T programs are included in the Geospace Cluster described in Appendix A.3

(2) Low Cost Access to Space (LCAS) Programs have as their objectives: (i) allowing investigation that require the space-flight of instrumentation, and (ii) proof-testing new concepts in experimental techniques that may ultimately find application in Sun-Earth Connection missions. The LCAS program for Solar Physics is treated in the Solar and Heliospheric Physics cluster and the combined LCAS program for Magnetospheric and ITM physics is treated in the Geospace Cluster.

(3) Sun-Earth Connection Theory Program (SECTP). This program supports efforts to attack problems concerning phenomena relating to the Sun-Earth Connection program that are beyond the scope of the nominally smaller SR&T tasks discussed above using relatively large "critical mass" groups of investigators. Funding for SECTP is competed in its entirety every three years. A SECTP competition was advertised through the ROSS-98 NRA, and the next opportunity to propose is not anticipated until ROSS-2001; see Appendix A.1.1.

(4) Guest Investigator (GI) Programs. Guest Investigator Programs are intended to maximize the return from currently ongoing missions by providing support for research which heavily utilizes mission specific data from currently operating spacecraft. Current Sun-Earth Connection GI programs are summarized in Appendix A.1.2

Proposals to any of the SEC program elements are expected to present, within their Scientific/Technical/Management Section (see Section C.5.3 of Appendix C):

- a clear description of a specific scientific problem;
- a description of how the attack on this problem will be carried out; and
- a discussion of the relevance of the proposed research to NASA's current and/or future programs.

Proposals for instrument and/or technique development are welcome, but must demonstrate that the proposed development is important to the solution of some important science question.

## II. Solar System Sciences

The Origin and Evolution of Solar System Bodies Cluster A.4 includes the following programs: Cosmochemistry, Planetary Geology and Geophysics, Origins of Solar Systems, Mars Data Analysis, and Lunar Data Analysis. This Cluster relates primarily to the Solar System Exploration science theme, though one of its components also relates strongly to the Astronomical Search for Origins theme as well.

(1) The Cosmochemistry Program (Appendix A.4.1) supports scientific investigations that are cosmochemical in nature and may involve laboratory studies of a variety of extraterrestrial materials (meteorites, cosmic dust, and lunar samples) or understanding of the geochemical nature of the solar system bodies.

(2) The Planetary Geology and Geophysics (Appendix A.4.2) program supports scientific investigations of the planetary surfaces and interiors, satellites (including the Moon), satellite and ring systems, and smaller solar system bodies such as asteroids and comets.

(3) The Origins of Solar Systems Program (Appendix A.4.3) solicits basic research proposals to conduct scientific investigations related to understanding the formation and early evolution of planetary systems and to provide the fundamental research and analysis necessary to detect and characterize other planetary systems.

(4) The objective of the Mars Data Analysis Program (Appendix A.4.4) is to enhance the scientific return from the Mars Pathfinder (MPF) and Mars Global Surveyor (MGS).

(5) The objective of the Lunar Data Analysis Program (Appendix A.4.5) is to enhance the scientific return from the Lunar Prospector Mission (LPM) by broadening the scientific participation in the analysis of the LPM data.

The Planetary Systems Science Cluster A.5 is an element of the Solar System Exploration (ESS) science theme of NASA's Office of Space Science (OSS). This cluster supports investigations of all classes of objects in the Solar System except the Earth and Sun, consistent with the strategy for Solar System Exploration embodied in Mission to the Solar System: Exploration and Discovery, A Mission and Technology Roadmap (available at <http://sse.jpl.nasa.gov/roadmap/>). The programs within this section are described briefly as follows:

(1) Planetary Astronomy (Appendix A.5.1) supports ground-based telescopic observations that contribute to understanding the general properties and evolution of planets, natural satellites, asteroids, and comets.

(2) Near Earth Object Observations (Appendix A.5.2) supports ground-based telescopic observations to inventory the population of near Earth Objects and to characterize a representative sample of them.

(3) Planetary Atmospheres (Appendix A.5.3) supports investigations directed at the understanding of atmospheres, including their formation, evolution, and fundamental properties.

(4) Planetary Suborbital Research (Appendix A.5.4) provides support for the remote sensing of solar system objects from sounding rockets, stratospheric balloons, Shuttle-based platforms, or the Space Station. Proposals for fabrication of flight instruments are appropriate only in the suborbital program.

Proposals to any of these programs must present, within their Scientific/Technical/Management Sections (see Section C.5.3 of Appendix C):

- a clear description of a specific scientific problem;
- a description of how the attack on this problem will be carried out; and
- a discussion of the relevance of the proposed research to NASA's current and/or future programs.

Proposals whose intent or purpose is to extend or directly supplement investigations selected for approved space flight missions are not appropriate for this NRA. Investigators who are members of the science teams of ongoing missions and who propose to use data from these missions in their SR&T efforts must clearly delineate between their mission responsibilities and the proposed efforts.

### III. Astrobiology and Planetary Instrumentation

The Astrobiology and Planetary Instrumentation Cluster (Appendix A.6) includes Exobiology research, as well as the Planetary Instrument Definition and Development and the Planetary Major Equipment. This Cluster relates to both OSS science themes Astronomical Search for Origins and Solar System Exploration.

(1) The Exobiology Program (Appendix A.6.1) seeks to understand the origin, evolution, and distribution of life in the universe. Research is centered around the origin of life and is focused on achieving this goal by tracing the pathways taken by the biogenic elements, leading from the origin of the universe through the major epochs in the evolution of living systems and their precursors. In addition, research in the area of planetary protection and exobiology instrument concepts may also be supported.

(2) The Planetary Instrument Definition and Development Program (Appendix A.6.2) supports the advancement of spacecraft-based instrument technology that shows promise for use in scientific investigations on future planetary missions. The goal of the program is not to develop flight-qualified hardware but rather to define and develop scientific instruments or components of such instruments to the point where the instruments may be proposed in response to future announcements of flight opportunity without additional extensive technology development.

(3) The Planetary Major Equipment (Appendix A.6.3) program allows proposals for upgrading the analytical, computational, telescopic, and other instrumentation required by investigations sponsored by the Solar System Exploration programs, including Exobiology.

#### IV. Space Astrophysics

The Space Astrophysics Research and Analysis (SARA) program as described in Appendix A7.1 of this solicitation is a consolidation of the programs previously known as Space Astrophysics Suborbital, the Space Astrophysics Detector Development, and the Space Astrophysics Research and Analysis, which were separate elements of NRA 99-OSS-01 (ROSS-99). This Cluster relates strongly to both the Astronomical Search for Origins and the Structure and Evolution of the Universe OSS science themes. It now contains all research elements of both the Ultraviolet, Visible, and Gravitational Astrophysics program and the Infrared, Submillimeter, Radio, and Interferometry Astronomy program, as well as the laboratory astrophysics component of the High Energy Astrophysics program. The primary goal of the SARA program is to obtain a better understanding of astrophysical objects and phenomena as revealed through their electromagnetic radiation characteristics in the wavelength regime greater than approximately 100 Å through the radio spectrum, and studies in relativity, gravitational astrophysics and tests of the fundamental laws of physics as relevant to astrophysics, and cosmology.

NASA intends to solicit proposals for the consolidated SARA program every year. An annual solicitation will provide more frequent opportunities to investigators for proposing new ideas. However, since the evolution to an annual solicitation is within the previously available budgets for these programs, the budget wedge available for funding new programs through this solicitation is very limited. The wedge is expected to grow only as the phasing of the component programs change and the funding cycle reaches a steady state.



## V. High Energy Astrophysics

The High Energy Cluster represents the consolidation of the High Energy Astrophysics (HEA) (now called X-Ray and Gamma-Ray Astrophysics [A.8.1]) and Cosmic Ray Physics (CRP) (now called Cosmic Ray Astrophysics [A.8.2]) Program Elements as defined in the ROSS-99 NRA. This new program element solicits basic research proposals to conduct investigations that are relevant to the NASA X-Ray and Gamma-Ray (XGA) and Cosmic Ray Astrophysics (CRA) Supporting Research and Technology (SR&T) Programs. The primary goal of the XGA and CRA programs is to obtain a better understanding of astrophysical objects (excluding the Sun) and phenomena as revealed through their high-energy radiation characteristics and to conduct studies of the origin, acceleration, and transport of galactic cosmic rays. This Cluster will be jointly managed by the Discipline Scientists responsible for the above programs.

In prior Announcements, proposals for participation in the HEA (XGA) and CRP (CRA) SR&T Programs were solicited and reviewed on a three-year cycle. Starting with this NRA (for investigations commencing in Fiscal Year (FY) 2001), the solicitation and review of proposals for participation in the above programs will be conducted jointly. In addition, a transition to an annual solicitation/review cycle will begin, with the goal of reaching a steady-state situation by FY 2003 in which approximately one third of the total Cluster funds will be made available annually. In the case of the HEA (XGA) SR&T Program, which underwent its three-year review in response to the ROSS-99 NRA, this transition to annual reviews was begun by selection of a mix of one-, two-, and three-year projects in response to that NRA. For the CRP (CRA) SR&T Program, which underwent its three-year review two years earlier in response to the ROSS-98 NRA, this transition has required that some of the ongoing grants be terminated one year early, i.e., nominally after two years instead of three. The impacted grantees have been notified of their need to respond to this NRA.

## VI. Interdisciplinary Program Elements

For purposes of this ROSS-2000 NRA, the only component of this Cluster (Appendix A.9) is the Applied Information Systems Research (AISR) program, which supports information systems research to apply new developments in computer science and information technology to improve and enhance ongoing support for any of the OSS science programs. The specific goals of the AISR program are to:

- Increase the scientific return on research within all OSS science themes by making advanced tools and capabilities available for the acquisition and utilization of science data and information;
- Exploit advances in computer science and information technology for the benefit of space science; and
- Promote strong collaborations involving the space science community, computer science community, data system engineers and technologists, academia, and the private sector and technology innovators.

### A.1.1 Sun-Earth Connection Theory Program (SECTP)

#### 1. Scope of Program

The scientific purview of the SECTP encompasses solar physics, heliospheric physics, magnetospheric physics, and ionospheric, thermospheric, and mesospheric physics. The SECTP supports theory and modeling investigations of the highest scientific quality dealing with problems of fundamental importance within or transcending the boundaries of these individual disciplines. The key characteristics of successful SECTP investigations are that they are of the highest intrinsic scientific quality, and that they also propose to attack problems falling within the Sun-Earth Connection science theme of sufficient breadth that their successful completion requires the efforts of a synergistically interacting group of investigators. Proposals that serve only as an umbrella for a variety of separate research tasks, even though the tasks are related by a common theme, are not appropriate for the SECTP. Proposals for narrowly focused and/or smaller scope theoretical efforts should be submitted to the individual SEC science discipline program elements described in this appendix. An important characteristic of the SECTP is that it encourages the exploration and development of new areas in the Sun-Earth Connection theme, especially interdisciplinary ones, and, in so doing, may develop objectives for future but as yet undefined space missions.

#### 2. Programmatic Information

Selections for the SECTP are nominally for a three-year period of performance with annual funding allotments contingent upon the submission of satisfactory progress reports and available funding. The most recent SECTP selections were carried out under the auspices of the ROSS-98 NRA, and funding for the selected investigations started in Fiscal Year 1999. The total budget for this program element is about \$3.5 M. The next selection opportunity is expected to be advertised in ROSS-2001. Therefore, proposals for this program element are not solicited through this current ROSS-2000.

Questions concerning this program may be addressed to the Discipline Scientist:

Dr. Mary Mellott

Research Program Management Division

Code SR

Office of Space Science

NASA Headquarters

Washington, DC 20546-0001

Telephone: (202) 358-0893

Facsimile: (202) 358-3087

E-mail: [mary.mellott@hq.nasa.gov](mailto:mary.mellott@hq.nasa.gov)

## A.10 EDUCATION/PUBLIC OUTREACH (E/PO) PROGRAM

### A.10.1 Scope of Program

The Office of Space Science (OSS) has developed a comprehensive approach for making education at all levels (with a particular emphasis on K-14 education) and the enhancement of public understanding of space science integral parts of all of its research missions and programs. To this end, OSS invites and encourages all proposers to this NRA to include an Education and Public Outreach (E/PO) component in their research proposals. In addition, anyone holding an existing multiple year research award already funded through any previous OSS NRA is encouraged to propose an E/PO supplement to their award (see details below). The two key documents that establish the basic policies and guidance for all OSS E/PO activities are a strategic plan, entitled *Partners in Education: A Strategy for Integrating Education and Public Outreach Into NASA's Space Science Programs* (March 1995), and an implementation plan, entitled *Implementing the Office of Space Science (OSS) Education/Public Outreach Strategy* (October 1996). Both of these documents may be obtained by selecting *Education and Public Outreach* from the OSS homepage at <http://spacescience.nasa.gov>, or from Dr. Jeffrey Rosendhal, Office of Space Science, Code S, NASA Headquarters, Washington, DC 20546-0001.

The following policies and guidelines apply to the E/PO activities solicited through this NRA:

- The proposed E/PO activity is expected to have general intellectual linkage to the science objectives of its “parent” proposal and/or the science expertise of its PI;
- An E/PO activity may be funded only as an add-on to a new or an existing award for a “parent” research proposal; therefore, the period of performance of the E/PO activity is restricted to that of its parent award;
- Up to \$10K per year may be proposed for an E/PO program, although larger budgets may be considered for a few exceptionally meritorious activities (Note: a Budget Summary must be submitted as part of an E/PO proposal as described further below);
- NASA requests (but does not require) that the submitting organization waive PI labor costs and its customary overhead charges on an E/PO budget, since in many cases such activities will directly aid a local educational or public science institution, and the budget available for this OSS E/PO program is extremely limited;
- The parent research proposal may identify an additional Co-Investigator who, along with the PI of the parent research proposal, will be responsible for completing the E/PO activities (e.g., an appropriately qualified colleague from the PI institution, or from an educational institution such as a public school district, science museum, planetarium, etc.);

- E/PO proposals will be evaluated (see criteria below) by appropriately qualified scientific, education, and outreach personnel, and the substance of these reviews will be conveyed to the proposers in a summary report; and
- The OSS Selecting Official will take into account proposed E/PO tasks and their review ratings when deciding on final selections and funding levels and as an aid in discriminating between highly qualified research proposals having otherwise comparable merits.

#### A.10.2 Evaluation Criteria

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##### IMPORTANT NEW INFORMATION

OSS has developed a document, entitled *Explanatory Guide to the NASA Office of Space Science Education and Public Outreach Evaluation Criteria*, as a resource for proposers who want to submit an E/PO proposal in conjunction with their research proposal. This *Explanatory Guide* may be accessed through the OSS homepage Web site indicated above or directly at <http://spacescience.nasa.gov/education/guide.html> ; navigation through this *Explanatory Guide* at its Web site is facilitated by internal active links. This *Guide* is not an extension of the E/PO requirements or criteria but is meant to provide an easy-to-follow introduction to this program using a series of Frequently Asked Questions (FAQ), followed by a detailed discussion of the E/PO review criteria given below. All proposers who are considering the submission of an E/PO proposal but who are not familiar with the specific OSS standards for E/PO activities are urged to review this *Explanatory Guide*.

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Based on the OSS E/PO strategy and implementation plans noted above, there are two classes of evaluation criteria against which proposed E/PO activities will be evaluated. Although creativity and innovation are certainly encouraged, note that neither of these sets of criteria concerns the originality of the proposed effort. Instead, NASA seeks assurance that the proposer is personally committed to the E/PO effort and that the PI of the parent proposal and/or appropriate research team members will be actively involved in carrying out a meaningful, effective, credible, and appropriate E/PO activity; that such an activity has been planned and will be executed; and that the proposed investment of resources will make a significant contribution towards meeting stated OSS plans and objectives (interested proposers to this E/PO program are urged to consult the *Explanatory Guide* referenced above).

#### General Criteria

The following general criteria will be applied to the evaluation of all proposals and reflect requirements necessary for further consideration by NASA OSS of an E/PO proposal:

- The quality, scope, and realism of the proposed E/PO program including the adequacy, appropriateness, and realism of the proposed budget;

- The capabilities and commitment of the proposer and the proposer's team to carry out the proposed E/PO program, including the direct involvement of one or more science team members in overseeing and carrying out the proposed E/PO program (Note: this criterion is intended to preclude proposals that serve only to "pass through" money to an external organization or individual who would carry out the proposed E/PO activity, since such a case is inconsistent with the intention of OSS that the research community be actively involved in education and public outreach);
- The establishment or continuation of effective partnerships with institutions and/or personnel in the fields of educational and/or public outreach as the basis for and an integral element of the proposed E/PO program; and
- The appropriateness of plans for evaluating the effectiveness and impact of the proposed education/outreach activity.

### Specific Criteria

To ensure that the goals and objectives of the OSS E/PO strategy are realized in practice, E/PO proposals will also be evaluated using at least one of the following specific criteria, as appropriate, for the submitted proposal. Because of the modest financial scope of this program, not all E/PO proposals can (or even should) address all of these specific factors; a sound, well-posed, and focused effort that will clearly be effective in reaching its intended target audience is preferable to an unrealistically broad effort. These specific criteria are:

- For proposals dealing directly with or strongly affecting the formal education system (e.g., teacher workshops or student programs carried out at public institutions such as science museums and planetariums), the degree to which the proposed E/PO effort is aligned with and linked to nationally recognized and endorsed education reform efforts and/or reform efforts at the state or local levels;
- The degree to which the proposed E/PO effort contributes to the training, involvement, and broad understanding of science and technology by underserved and/or underutilized groups; and/or
- The potential for the proposed E/PO activity to expand its scope by having an impact beyond the direct beneficiaries (e.g., reaching relatively large audiences, being suitable for replication or broad dissemination, and/or drawing on resources beyond those directly requested in the proposal).

### A.10.3 Options for E/PO Proposals

OSS expects that most E/PO proposals will be submitted by a single proposer as a supplement to a single science proposal submitted to one of the program components in this NRA. However, NASA OSS will allow two special options to this baseline pattern as discussed below (Note: as a departure from previous OSS NRA's, the so-called "Institutional" E/PO proposal option is no longer offered).

#### A.10.3.1 Submission of the Same E/PO Proposal with Multiple Research Proposals Submitted by the Same Proposer

OSS recognizes that a single proposer may submit more than one research proposal to different research components as defined in this NRA (see the summary cover letter and Appendix A). In such a case, that one proposer may submit the same E/PO proposal with all his/her research proposals subject to the three conditions that: (i) OSS will review such an E/PO proposal only the first time it is submitted; (ii) this one evaluation will carry through to all other submissions of that same E/PO proposal for this NRA as well as all other OSS NRA's to be issued in CY 2000; and (iii) such an E/PO proposal will be funded only once (i.e., NASA will not fund the same activity more than once even though it may be enhanced by such an increase in support). The Web page to be used for the submission of an E/PO proposal (see further below) will request information regarding the first submission and any subsequent submissions of this proposal to this NRA. Note that in such a case, the E/PO proposal must be resubmitted in the identical form as it was the first time; OSS does not have the resources to separately evaluate E/PO proposals that have only minor changes between such multiple submissions. Of course, multiple but substantially different E/PO proposals submitted by the same proposer will receive individual evaluations.

#### A.10.3.2 Submission of an E/PO Proposal as a Supplement to an Existing Multiple Year OSS NRA Award

In addition to PI's selected through this NRA, OSS also wants to encourage holders of existing awards to become involved in E/PO activities. Therefore, any PI of an existing multiple year award selected through any OSS NRA (including this one) having at least one year remaining in the award's period of performance may submit an E/PO proposal as a supplement to that "parent" research award. The period of performance for such a supplemental E/PO activity is limited to that of the parent research award. Such a supplemental E/PO proposal must be prepared and submitted as a stand-alone proposal following the format and guidelines given below in Section 10.5.

The deadline for the submission of such an E/PO supplemental proposal is the same month and day as the NRA through which the parent proposal was selected (if there are any questions, contact the relevant Discipline Scientist for that program component). Such supplement proposals will be reviewed using the criteria given above, and, if accepted, the E/PO funding will start on the anniversary date of the parent award.

#### A.10.4 Assistance for the Preparation of E/PO Proposals

To help interested proposers in developing a effective E/PO proposals, NASA OSS has established a nationwide infrastructure of space science education/outreach groups to directly aid space science investigators in identifying and developing high quality E/PO opportunities. This infrastructure provides the coordination, background, and linkages for fostering partnerships between the space science and E/PO communities, and the services needed to establish and maintain a vital national, coordinated, long-term OSS

E/PO program. The two elements of this system of particular interest to researchers interested in submitting E/PO proposals are:

- Four OSS science theme-oriented "E/PO Forums" that aid OSS in organizing the comprehensive education/outreach aspects of OSS space science missions and research programs, and provide both the space science and education communities with ready access to relevant E/PO programs and products; and
- Five regional "E/PO Broker/Facilitators" that search out and establish high leverage opportunities, arrange alliances between educators and OSS-supported scientists, and help scientists turn results from space science missions and programs into educationally-appropriate activities suitable for regional and/or national dissemination.

Prospective proposers are strongly encouraged to make use of these groups to help identify suitable E/PO opportunities and arrange appropriate partnerships and alliances but should note that the responsibility for actually developing the E/PO program and writing the proposal is that of the proposer. Points of contact and addresses for all of these E/PO Forums and Broker/Facilitators are found by opening *Education and Public Outreach* from the menu of the OSS homepage at <http://spacescience.nasa.gov> .

#### A.10.5 Preparation and Submission of an E/PO Proposal

To aid interested proposers in composing and submitting a complete E/PO proposal, NASA OSS has established a comprehensive electronic form that is accessed through menu on the Web site <http://www.lpi.usra.edu/panel/> . Completion of all the fields of this electronic form with the requested information and text is necessary before a proposal may be submitted for evaluation (Note: only electronically submitted E/PO proposals will be evaluated). This site may be accessed at any time up to the due date for each of the proposals as given in the cover letter of this NRA, and by using a unique identification number that will be provided at the time of first access, all fields may be edited up to final submission. The requested information may be transferred from any standard word processing software, although only text may be used to complete these fields on this Web site; i.e., this site will not accept illustrations or drawings. As an aid in developing the required information for the final electronic submission, this E/PO format may also be printed at any time.



This Web submission also requires a summary of the E/PO budget (both total and by year) using the same format shown for the research Budget Summary form shown in Appendix C.6 in this NRA. As a change from previous practice for E/PO proposals, it is no longer necessary to integrate the E/PO budget with that of its parent research proposal; however, for new proposals it is still necessary to state the summary E/PO budget (in total and by year) on the proposal *Cover Sheet* (see Section C.5.2).

Once it is submitted, the completed E/PO proposal (including all Budget Summary sheets) can then be printed out from the Web site by the proposer to provide the appropriate hard copy for submission either with their parent research proposal, or as a separate supplemental proposal if it is being submitted as an addition to an existing award (see above).

#### A.10.6. Reporting Activities for Approved E/PO Proposals

In order to assist OSS in obtaining a coherent picture of the entire portfolio of E/PO efforts supported across all OSS programs a brief report of selected E/PO activities are to be provided as part of the annual Progress Reports required for the parent research award (Note: it is expected that all such Progress Reports for the proposals selected through this NRA will be submitted electronically through a to-be-designated Web site). In addition, one of the OSS Education Forums (see above) will contact the PI's of selected E/PO components to obtain basic summary information concerning the nature of and intended audience for their selected E/PO effort.

#### A.10.7 Additional Information

General questions about this E/PO program may be directed to:

Dr. J. David Bohlin  
Research Program Management Division  
Code SR  
Office of Space Science  
National Aeronautics and Space Administration  
Washington DC 20546-0001  
Telephone: (202) 358-0880  
E-mail: [david.bohlin@hq.nasa.gov](mailto:david.bohlin@hq.nasa.gov)

Finally, attention is also called to the Initiative to Develop Education through Astronomy and Space Science (IDEAS) program administered by the Space Telescope Science Institute (STScI) on behalf of OSS. The IDEAS program is open to any space scientist based in the U.S. regardless of whether or not they hold a research grant from NASA OSS. This program, which selects proposals yearly, provides awards of up to \$40K to foster the development of innovative approaches to space science education and outreach by space scientists and their educator partners. The annual solicitation for the IDEAS program is typically released in July with proposals due in October. The annual request for proposals is posted at. Inquiries may be addressed by E-mail to [IDEAS@stsci.edu](mailto:IDEAS@stsci.edu) or by postal mail to: IDEAS Program, Office of Public Outreach, Space Telescope Science Institute, 3700 San Martin Drive, Baltimore MD 21218.

SPECIFIC GUIDANCE FOR RESPONDING TO THE ROSS-2000 NRA

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## C.1 Introduction

### C.1.1 General Provisions and Policies

- *Relationship of Appendices B and C.* The material in Appendix C augments and supplements the material in Appendix B of this NRA. In case of conflict, the material in Appendix C takes precedence.
- *Nominal Period of Performance for Selected Proposals.* Unless otherwise specified in Appendix A, the period of performance for a proposal submitted in response to this NRA is restricted to three years or less. For such multiple year awards, yearly funding allotments are provided only after the submission of an acceptable progress report. The period of performance for an Education/Public Outreach (E/PO) proposal is restricted to that of its “parent” research award (see Appendix A.10).
- *Unrestricted Freedom to Propose to this NRA.* NASA OSS welcomes proposals in response to this NRA from all qualified proposers. Participation in this program is open to all categories of U.S. and non-U.S. organizations, including educational institutions, industry, nonprofit institutions, NASA Centers, and other Government agencies. Historically Black Colleges and Universities (HBCU’s), other minority educational institutions, and small businesses and organizations owned and controlled by socially and economically disadvantaged individuals or women are particularly encouraged to apply. In accordance with Federal statutes and NASA policy, no eligible applicant shall be excluded from participation in, denied the benefits of, or be subjected to discrimination under any program or activity receiving financial assistance from NASA on the grounds of race, color, creed, age, sex, national origin, or disability.
- *Opportunity to Propose Educational/Public Outreach Activities.* Educational/Public Outreach (E/PO) activities are now considered vital and integral parts of all NASA space science missions and research programs. Therefore, NASA OSS encourages proposers to this NRA to submit an E/PO proposal as a supplement to their “parent” research proposal in accordance with the guidelines given in Appendix A.10. Additionally, any existing multiple year OSS research award having at least one full year remaining in its period of performance can serve as a “parent” proposal for an E/PO supplement; therefore, the Principal Investigators of such awards are encouraged to propose E/PO activities.
- *Anticipated Level of Competition for Selection.* Regardless of the budgets that are indicated as available in Appendix A for the various programs, prospective proposers are advised that competitions for NASA programs have traditionally been extremely competitive. In the last several years, because of the shortage of resources, typically as few as one out of four to five proposals have been selected for funding.

- *Public Access to Data.* As a matter of NASA policy, all data taken or products created in the performance of a NASA research award are considered to be public domain. In addition, NASA may judge that new data or products (including items produced in the pursuit of an Education/Public Outreach proposal) obtained through an investigation selected through this NRA may be of value to the science and/or education communities at large. If so, NASA reserves the right to direct that such items be deposited in an approved publicly accessible site and, if so, will negotiate appropriate funding to enable such activities (e.g., the reduction and calibration of the data into a format amenable for use by peer scientists).

- *Data and Computational Infrastructure.* Information on current space science data centers and services can be found on the World Wide Web at <http://ssds.nasa.gov> , whereas information on high performance computing resources can be found at <http://spacescience.nasa.gov/hecc>.

Any need for high performance computing resources for the proposed research should be explicitly described in the proposal, including the computing system, location, and an estimate of the amount of computing time needed.

- *Late proposals.* NASA's general policy on late proposals is given in Part (g) of Appendix B and states that such a proposal may be considered only if it is judged to be in the best interests of the Government. Owing to the historically large over-subscription of proposals for NASA's programs, a proposal submitted after the published deadline is unlikely to be considered of uniquely greater value to NASA than the proposals that are submitted on time. Finally, note that processing delays at the proposer's home institution or its method of shipping does not excuse the late submission of a proposal.

### C.1.2 Types of Proposing Institutions

NASA OSS accepts proposals in response to its NRA's from all types of U.S. and non-U.S. institutions (proposals from non-U.S. institutions must adhere to the provision of Section 4 of this Appendix). As an aid to NASA in deciding on the appropriate type of award or agreement in the event that the proposal is selected, one of the categories listed below must be indicated at the appropriate line on the proposal's *Cover Page* (see Section 5.3 of this Appendix):

- *Educational institution* -- A university or two- and four-year college (including a U.S. community college) accredited to confer degrees beyond that of the K-12 grade levels (all such institutions are considered by NASA as nonprofit).
- *Nonprofit, nonacademic organization* -- A private or Government supported research laboratory, university consortium, museum, observatory, or similar organization that supports advanced research but whose principal charter is not for training of students.

- *Commercial organization* -- An organization of any size that operates for profit (fee basis) and with appropriate capabilities and interests to conduct basic research in science.
- *NASA Center* -- All NASA Field Centers and the Jet Propulsion Laboratory.
- *Other Federal Agency* -- Any non-NASA, U.S. Federal Executive agency or Federally Funded Research and Development Center (FFRDC) sponsored by a Federal agency.
- *Unaffiliated U.S. resident* -- Any person residing in the U.S., whether a U.S. citizen or resident alien, who has the capabilities and access to facilities for carrying out the proposed project and who, if selected, agrees to fiscal arrangements that, in NASA's opinion, ensures responsible management of appropriated Federal funds.
- *Non-U.S. Organization* -- Institutions outside the U.S. that propose on the basis of a policy of no exchange of funds (consult Section (I) of Appendix B for specific details).

### C.1.3 Proposal Personnel

Every organization submitting a proposal in response to this NRA must designate a single *Principal Investigator* (PI) who will be responsible for the quality and direction of the entire proposed investigation and for the use of all awarded funds. Note that NASA does not accept the designation of a "Co-Principal Investigator;" there must be only one PI who is solely responsible for an investigation.

NASA strongly encourages proposers to identify only the most critically important personnel to aid in the execution of their proposals. Should such personnel be required, *Co-Investigators* (Co-I's) may be identified who are critical for the successful completion of an investigation through the contribution of unique expertise and/or capabilities, and who serve under the direction of the PI, regardless of whether or not they receive compensation directly under the award. A Co-I must have a well-defined role in the investigation that is explicitly defined in the Management section of the proposal (see Section 5.3 below). In addition, for all proposals submitted in response to this NRA, evidence of the commitment of a Co-I to participate in the proposed investigation is required by way of a brief letter from him/her even if they are from the same institution as that of the PI (see Section 5.3 below).

There are two informal subcategories of Co-I's that a proposal may identify in its Management section (see Section 5.3 below), as appropriate:

A Co-I may be additionally designated as the *Science PI* for those cases where the proposing institution does not permit that individual to formally serve as the PI as defined above. In such a case, the Science PI will be understood to be in charge of the scientific direction of the proposed work, although the formally designated PI is still held responsible by NASA for the overall direction of the effort and the use of funds.

A senior, leading Co-I may be additionally designated as an *Institutional PI* if his/her institution is committed to make a major contribution to a proposal

submitted by a PI from another institution, e.g., a substantial portion of an experimental investigation. At the recommendation of the responsible Discipline Scientist, NASA may elect to provide an award directly to that Co-I institution with the Institutional PI serving as the “PI” for what otherwise would be a subcontract from the proposing PI institution. However, in such a case, the proposal’s designated PI is still held responsible by NASA for the overall scientific direction of the proposed effort.

Finally, proposals may also identify unfunded Collaborators who are less critical to the overall proposal than a Co-I but who are committed to provide a specific contribution to the proposed task. As for Co-I’s noted above, proposals submitted in response to this NRA must include a brief letter of commitment from each Collaborator that describes their specific, intended contribution to the investigation.

#### C.1.4 Proposal Evaluation

Although OSS secures scientific and technical evaluations from appropriately qualified peers of the proposers, proposers are expected to provide sufficient detail to enable evaluation by persons who are knowledgeable of but not necessarily specialists in the proposed research. The evaluation criteria in part (i) of Appendix B, as amended below, applies to this NRA:

##### "(i) Evaluation Factors.

"(1) Unless otherwise specified in the NRA, the principal criteria that apply in evaluating a proposal are its intrinsic merit, its relevance to NASA's objectives, and its cost, where the first criteria is weighted approximately twice that of the second, and the second criteria is weighted approximately three times that of the third.

(2) Evaluation of intrinsic merit includes consideration of the following factors listed in approximate order of decreasing importance:

- The overall scientific and/or technical merit of the proposal and/or unique and innovative methods, approaches, concepts, or advanced technologies demonstrated by the proposal, and the potential impact of the proposed research to its field;
- The qualifications, capabilities, and experience of the proposing Principal Investigator and all other personnel who are proposing to help achieve the proposal's objectives;
- The proposing institution’s capabilities, related experience, facilities, techniques, or unique contributions of these that are integral factors for achieving the proposal objectives; and
- The overall standing of the proposal against the known state of the art.

(3) Relevance to NASA’s objectives shall mean relevance to the specific objectives and goals as described in this NRA for which the proposal is submitted,

as well as more generally to the NASA OSS science themes and goals as defined in the most current OSS strategy documents.

(4) Evaluation of the cost of a proposed effort shall include the realism and reasonableness of the proposed cost with respect to the proposed effort.

#### C.1.5 Proposal Selection and Implementation

Following peer evaluation, the cognizant Discipline Scientist will further review the scientifically and technologically top rated proposals against the programmatic objectives, program balance, and financial resources available for that Cluster. Based on these factors, including judgment of the comparison of the scope and importance of the proposed investigation to its cost, the Discipline Scientist then will present a recommendation for selection to the NASA Selecting Official (identified in this NRA's covering summary letter). A critical consideration in the selection of proposals for funding will be to maximize scientific return within the available budget. To achieve this objective, NASA will weigh the proposed costs of those proposals deemed meritorious against the available funding; final selection will reflect an appropriate balance. The Selecting Official will select for funding those proposals deemed worthy as judged against all of the evaluation criteria and for which financial resources are available. The Selecting Official will also decide on the selection of Education/Public Outreach (E/PO) proposals of merit that are associated with those research proposals being considered for selection. An E/PO proposal of merit will be used as an additional factor to discriminate between research proposals of otherwise equal merits as described in Section C.1.4.

Each proposer will be notified by postal or electronic mail of their selection or nonselection and offered a debriefing to explain that decision. Note that NASA reserves the right to offer selection of only a portion of a proposed investigation; in such a case the proposer will be given the opportunity to accept or decline the offer. Those recommended for selection will be informed of the recommended amount of their award and that their organization will be contacted by a NASA Procurement Office to arrange for an appropriate funding instrument (e.g., a grant, contract, or work order). In all cases, awards are made to the proposing institution, not directly to the proposal's PI. No financial commitment on the part of NASA or the Government may be inferred from any communication, even if in writing, from the NASA Discipline Scientist or Selecting Official. Only a NASA Procurement Office can make financial commitments, obligations, or awards on behalf of the Agency and authorize the expenditure of funds.

#### C.2 Notice of Intent to Propose

In order to plan for a timely and efficient peer review process, *Notices of Intent* (NOI's) to propose are requested by the date given in the summary cover letter of this NRA. The submission of a NOI is not a commitment to submit a proposal, nor is information contained therein considered binding on the submitter. NOI's are to be submitted electronically by entering the requested information through the World Wide Web site identified in Appendix A, which will request at least the following information:



- reference to this NRA by its alpha-numeric identifier (Note: this may be included on the Web site template);
- the program component from Appendix A for which a proposal may be submitted (Note: the Web site may provide a menu from which the appropriate component may be selected);
- the Principal Investigator's name, physical location mailing address, phone number, and E-mail address;
- the name(s) and institution(s) of any Co-Investigator(s) known by the NOI due date;
- a "Yes/No" indication of the intent to submit an E/PO proposal;
- a descriptive title of the intended investigation; and,
- a brief description of the investigation to be proposed.

Additional information may be requested specific to the program description in Appendix A. A separate NOI must be submitted for each intended proposal. Note that this NOI may also be the preliminary version of the proposal *Cover Page/Proposal Summary*; if so, the Web site will provide a password to the user for future use in updating this information for the final *Cover Page/Proposal Summary* as the deadline for submission of the final proposal approaches (see further discussion in Section C.5.3 below).

### C.3 "Renewal" Proposals

Holders of existing research awards frequently propose in response to successive NRA's in the same program area in order to extend an ongoing research activity to its next logical step. However, in order to ensure equitable treatment of all submitted proposals, NASA OSS does not extend any special consideration to such proposals in terms of preferential handling, review, or priority for selection. Therefore, OSS does not recognize or use the term "renewal proposal" as discussed in Part (d) of Appendix B. Instead, all proposals in response to OSS NRA's are considered "new" regardless of their previous history of NASA funding. Nevertheless, such follow-on proposals are welcome and encouraged and should indicate relevant achievements made during the course of any previously existing award in its *Scientific/Technical/Management Section* (see below in Section C.5.3).

However, in order to allow their identification and assessment of previous achievements, proposers who seek to extend the thrust of an existing research activity for which NASA funding will expire in the current Fiscal Year should enter the existing NASA grant or contract number in the designated field on the proposal *Cover Page* (see Section 5.3 below for details). Such follow-on proposals must otherwise fully comply with all guidelines for preparation, content, and submission as outlined in this NRA, and they will be reviewed on an equal basis with all other submitted proposals. If such a follow-on proposal is selected, it is now NASA policy to fund the follow-on investigation through a totally new award having a new award number whose starting date follows that of the expiration date of the existing award.

#### C.4 Guidelines for International Participation

Guidelines for proposals involving non U.S. participation either as the Principal Investigator or as a Co-Investigator must follow the guidelines given in Section (I) of Appendix B. Note especially the requirement for the submission of a letter of endorsement from the government agency or funding/sponsoring institution that is sponsoring the non U.S. participation.

#### C.5 Guidelines for Preparation of Proposals

##### C.5.1 Standard Default Formats

The standard, default formats for all proposals submitted in response to this NRA are as follows:

- Typewritten English text using an easily read font having  $\leq 15$  characters per inch on white, 8.5x11 inch paper (or A4 stock for non-U.S. proposals).
- Single or double column format with at least 1 inch (2.5 cm) margins all around.
- Double-sided printing preferred but not required.
- Bound only with metal staples to facilitate recycling (i.e., no cardboard or plastic covers or permanent binders), with the original copy bound in a manner that allows easy disassembly should NASA need to make additional copies.
- No fold out pages, colored illustrations, or photographs unless critical for the unique display of important proposal data.
- No material submitted on any type of electronic media, nor reference to World Wide Web sites for material needed to complete or review the proposal.
- Use of only metric and standard astronomical and engineering units.
- Strict adherence to the fixed page limits given in Section C.5.2.

## C.5.2 Checklist For Proposal Preparation and Submission

Details for each item are given in the same order in Section C.5.3.

PRESUBMISSION ACTIVITIES
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- *Notice of Intent (NOI) to Propose* - The NOI is electronically submitted to the World Wide Web site given in the program component of interest in Appendix A and by the date given in the cover summary letter of this NRA (this Web site will be open for submissions starting approximately 30 days prior to the due date for the NOI and 90 days prior to the due date for the proposals themselves).
  
- *Cover Page/Proposal Summary* - The information required for the Cover Page/Proposal Summary is initially entered on the World Wide Web site given in the program component in Appendix A and according to the directions below. It is then printed out in hard copy by the proposer in order to secure original signatures as required for submission with the copies of the proposal itself by the deadlines in the cover letter (this Web site will be open for submissions approximately 45 days prior to the due date for the proposals themselves)..

CONSTITUENT PARTS OF A PROPOSAL (in order of final assembly)
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	<u>PAGE LIMITS*</u>
— <i>Cover Page/Proposal Summary</i>	Per printout from Web
— <i>Table of Contents</i>	1
— <i>Summary of Personnel, Commitments, and Costs</i>	1
— <i>Scientific/Technical/Management Section</i>	≤15**
— <i>References</i>	None
— <i>Facilities And Equipment</i> (as needed and appropriate)	≤2
— <i>Education/Public Outreach</i> (optional)	Per printout from Web
— <i>Curriculum Vitae</i>	for the PI: ≤3 For each Co-I: ≤1
— <i>Current and Pending Support</i>	None
— <i>Statement(s) of Commitments from Co-I's and/or Collaborators</i>	None
— <i>Research Budget Summary and Details</i>	None
— <i>Reprints/Preprints</i> (optional; maximum of 2)	N/A

\* where each side of a sheet containing text or illustration counts as a page and each “n-page” fold-out counts as n-pages.

\*\* including illustrations, tables, and figures, unless otherwise specified in Appendix A.

SUBMISSION ACTIVITIES
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- *Cover Page/Proposal Summary* - print out final and complete version from specified Web site in time to secure the Principal Investigator and Authorizing Institution signatures, and to produce the required number of hard copies to be submitted (originally signed *Cover Page/Proposal Summary* to preface original of proposal).
- *Education/Public Outreach Proposal* (optional) - print out final and complete version from specified Web site in time to include as part of final hard copy of proposal.
- Provide for delivery of the specified number of hard copies (15 plus signed original unless otherwise specified in Appendix A) of the proposal to the correct address by close of the normal business day on the specific Due Date (see the summary cover letter for submission date and the relevant section in Appendix A of this NRA for the submission address).

### C.5.3 Details of Proposal Contents

All proposals in response to this OSS NRA should be assembled with the following parts (note that some are as required or optional) in the order listed. Proposals that omit any of their required parts will be returned without review. The individual science program component descriptions in Appendix A may also ask for materials in addition to these items. For convenience, each of the items below is cross-referenced to the corresponding part of Appendix B of this NRA. Note: Several parts of Appendix B are not cited but should also be considered for a complete understanding of all the policies and provisions for proposals solicited through this NRA.

- *Cover Page/Proposal Summary* [Appendix B.(c)(1) and (3)]

All proposals must be prefaced by an integrated *Cover Page/Proposal Summary* that contains important, required information (see below). This item is produced by first entering the requested information electronically through a World Wide Web site (specified for each program component described in Appendix A) and then printing out this form by the proposer. Note that a sample of this Web form may be printed out at any time for preliminary inspection, and that the only valid format for submission of this item is through the Web. The printed copy of the electronically submitted form is then used to obtain original signatures of the PI and an official from the proposing institution to submit with the original copy of the proposal.

Upon accessing the specified Web site, at a minimum the following information for the *Cover Page* will be requested:

- Alpha-numeric identifier of this NRA and full name of the NASA Research Announcement (Note: these may already be included on the electronic form through use of a menu).

- Name of program component within this NRA to which the proposal is directed.
- Name and full institutional physical location mailing address of the proposing Principal Investigator, telephone and facsimile numbers, and E-mail address (Note: an open block for signature and date will be provided on the printed hard copy).
- Full descriptive title of proposed investigation.
- Abbreviated title of proposed investigation (limited to 50 characters).
- NASA Grant or Contract Number of any current NASA award that the PI may hold that is a logical predecessor of the newly proposed work.
- Names, institutional affiliations, and E-mail addresses of any Co-Investigators (see definition of Personnel in Section C.1.3; also note that all listed Co-I's must also be functionally identified in the proposal – see Section C.5.3).
- Names, institutional affiliations, and E-mail addresses of any Collaborators (see definition of Personnel in Section C.1.3).
- The physical mailing address, telephone number, and E-mail address of the office of sponsored programs at the proposing institution.
- Institutional endorsement, including the name and title of the Authorizing Official, name of proposing institution (Note: an open block for signature and date will be provided on the printed hard copy).
- Designation of the type of institution per the definitions in Section 1.2 above.
- A “Yes/No” indication whether an E/PO proposal is also submitted.
- The budget for any optional E/PO proposal that is submitted with the proposal both by year and for the total proposed period of performance.
- The budget for the proposed research task both by year and for the total proposed period of performance.

A block of space ( $\leq 2000$  characters, including spaces, or about one-half page using the formats specified above) will be provided in the electronic *Cover Page/Proposal Summary* form for a self-contained *Proposal Summary* of the proposed research activity. Note that the electronic site is configured to allow this submission by transfer from any standard word processing software. The *Summary* provides background and perspective to the interested reader and, therefore, must include the following information:

- A description of the key, central objectives of the proposed research in terms sufficient for a non specialist to grasp its essence and a statement of methods proposed to accomplish those proposed objectives;
- The perceived significance of the proposed work to NASA OSS interests; and
- If the proposal contains a Education/Public Outreach proposal, a two or three sentence summary of the intended activity.

Special conditions and instructions concerning the *Cover Page/Proposal Summary*:

- 1) Changes (such as whiteout or strikethrough) to the printed *Cover Page/Proposal Summary* are not permitted. Any needed changes to the information submitted electronically may only be made by editing the electronic submission by following the instructions of the Web page, after which the final *Cover Page/Proposal Summary* is then printed in order to secure the necessary signatures.
- 2) The authorizing institutional signature on the *Cover Page* certifies that the proposing institution has read and is in compliance with the three required certifications printed in full in Section C.6 of this Appendix; therefore, it is not necessary to separately submit these certifications with the proposal.
- 3) Electronic submission of a *Cover Page/Proposal Summary* does not satisfy the deadline for proposal submission. The required number of proposal copies (see cover letter), must be received at the indicated address by the proposal due date.
- 4) NASA OSS publishes the names of the proposal, the PI, and the proposing institution, and the *Proposal Summary* of every selected investigation in a public data base (e.g., see "Selected Investigations" on menu at Web site <http://spacescience.nasa.gov/codesr/welcome.html> ). Therefore, the *Summary* should not include proprietary information that precludes its unrestricted release (see also Appendix B, (a)(2) and (c)(2)).

- *Table of Contents*

A one page *Table of Contents* should identify each of the key parts of the proposal, as well as the subsections of the proposal's central *Scientific/Technical/Management Section*. Each of the proposal's sections may be individually numbered.

- *Summary of Personnel, Commitments, and Costs*

The proposal must contain a one page summary list, in simple tabular form, that gives the names and intended work commitment for the PI and for every Co-I of the proposed investigation both in time (rounded to the nearest 0.01 of a Work Year of typically 1880 hours) and unburdened salary (rounded to the nearest \$1K) for each year of the proposed period of performance (Note: "unburdened" means without addition of overhead or fees). These entries of commitments should be shown separately for the research effort and for any proposed E/PO proposal. In addition, this list must contain the name(s) of any collaborator(s) associated with the proposal.

- *Scientific/Technical/Management Section* [Appendix B.(c)(4), (c)(5), and (c)(6)]

This *Section* is the main body of a proposal and should cover the following topics in the order given, all within the specified page limit:

- The objectives and expected significance of the proposed research, including a complete description of any instruments or hardware proposed to be built in order to carry out the research (note: see also the *Facilities and Equipment* section below for the description of critical equipment needed for carrying out the proposed research);
- The perceived impact of the proposed work to the state of knowledge in the field and, if the proposal is a direct extension of an existing OSS award, how the proposed work is expected to build on and otherwise extend the previous accomplishments to date;
- The technical approach and methodology to be employed in conducting the proposed research, including any special facilities of the proposing institution(s) and/or capabilities of the proposer(s) for carrying out the work;
- The relevance of the proposed work to past, present, and/or future NASA OSS programs and interests or to the specific objectives given in this NRA;
- An outline of the general plan of work, including anticipated key milestones for accomplishments and the management structure for the personnel involved; and
- A statement of the expected contribution by the PI and each Co-I identified on the proposal, whether or not they derive support from the proposed budget (Note: Co-I's who have either insignificant or unjustified roles will be considered a weakness for purposes of the evaluation of the proposal).

The *Scientific/Technical/Management Section* may contain illustrations that amplify and demonstrate key points in the main text of the proposal (including milestone schedules, if appropriate). Any illustrations and figures must be of publication quality, of an easily viewed size, and have self-contained captions that do not contain critical information not provided elsewhere in the proposal.

- *References*

All citations given in the *Scientific/Technical/Management Section* must be included in a list of references, which should include the full title of the paper and/or book, as appropriate, and an easily understood abbreviation of the publication.

- *Facilities and Equipment*

[Appendix B.(c)(7)]

As appropriate, this section should describe any facilities (including any U.S. Government owned facilities) and/or major equipment critical for carrying out the proposed project that are already available or would need to be purchased in order to carry out the proposed investigation. In the latter case, these costs should be entered in the required proposal *Budget Summary* and described in accompanying budget details.

- *Education and Public Outreach (E/PO) Proposal* (optional)

[Appendix A.10]

Proposals for E/PO efforts are strongly encouraged as an addition to any research proposal submitted in response to this NRA. The inclusion of an E/PO proposal of high merit will be used as an additional factor to help discriminate between research proposals of similarly high scientific, programmatic, and financial merits. An E/PO proposal must be submitted through a designated Web site (see Appendix A.10 in this NRA) and is then printed out for submission in hard copy with its parent research proposal. Part of this Web submission requires a summary of the E/PO budget (both total and by year) using the same format and categories shown for the research Budget Summary form shown in Section C.6 below. Therefore, the printout of the E/PO proposal will include its budget sheets. Note: Unlike previous OSS NRA's it is not necessary to integrate the E/PO budget with that of the parent research proposal. However, it is necessary to state the E/PO budget summary numbers on the proposal *Cover Sheet* (see above).

- *Curriculum Vitae*

[Appendix B.(c)(6)]

The PI must submit a *Curriculum Vitae* (not to exceed three pages) that includes his/her professional experiences, positions, and a bibliography of publications relevant to the proposal. The proposal must also include a one page *Vitae* for each key Co-I (unless otherwise specified in the Program Element in Appendix A). A Co-I who serves as a Science or an Institutional PI (see section C.1.3 above), or as the lead Co-I for an E/PO proposal, may submit a *vitae* using the same page limit as for the PI. *Vitae* from Collaborators are not to be submitted.

- *Current and Pending Support*

[Appendix B.(c)(10)]

Information must be provided for all ongoing and pending projects and proposals that involve the proposing PI and any Co-I's who are either expected to perform a significant share of the proposed work (e.g., as a Science or as an Institutional PI (see section C.1.3 above)), or who are proposed to receive support through the proposal. Information is required for each of two categories of support awards that may exist at the time of the proposal submission deadline, namely,

- a) Current Support (for any of the period that overlaps with the proposal being submitted to this NRA) and
- b) Pending Support (including the proposal to this NRA).



For each of these categories, provide the following information for each such key individual on the proposal team as noted above:

- Title of award or project;
- Program name (if appropriate) and sponsoring agency or institution (including point of contact);
- Proposed period of performance and budget; and
- Commitment in fractions of a full time Work Year (WY = 1880 hr).

In addition, provide the name of any other institution, including point of contact with telephone number, to which the proposal submitted to this NRA, or any part thereof, has been or will be submitted for consideration of funding. For such pending research, the PI's must notify the relevant Discipline Scientist immediately of any successful proposals that are awarded anytime after the proposal submission date until the time of selections.

• *Statement(s) of Commitment from Co-I's and/or Collaborators*

Every Co-I and Collaborator (including those from a non-U.S. institution) identified as a participant in the proposal must submit a brief, signed statement of commitment that acknowledges his/her participation even if they are from the PI's own institution. In the case of more than one Co-I and/or Collaborator, a single, multiply-signed statement is acceptable. Each statement should be addressed to the PI, may be a facsimile or E-mail, and must contain the following, or approximately similar, language:

“I(we) acknowledge that I(we) am(are) identified by name as Co-Investigator(s) [or Collaborator(s)] to the investigation entitled <name of proposal> that is submitted by <name of Principal Investigator> to the <name of Announcement> NASA Research Announcement, and that I(we) intend to carry out all responsibilities identified for me(us) in this proposal. I(we) understand that the extent and justification of my(our) participation as stated in this proposal will be evaluated during peer review in determining the merits of this proposal.”

• *Budget Summary and Details*

[Appendix B.(c)(8)]

Proposals must contain a *Budget Summary* (format given in Section c.6 of this Appendix) for each year of the proposed effort, as well as for the total period of performance, filled out in accordance with the following *Instructions for Budget Summary*. The Web site where this NRA is posted also has this form identified for downloading. Note especially the following important considerations:

(i) If a proposal is selected for award, failure to adequately address the provisions of the instructions for item 2.c will require that NASA contact the proposing institution for the required information. Such activity may delay the award until the purchase is either justified as a direct charge for general purpose equipment or is budgeted as an indirect expense.

(ii) If a PI from a non-Government institution proposes to team with a Co-I from a U.S. Government institution (for this purpose, JPL is considered a NASA Center), then the institutional budget for that Government Co-I is to be included in the proposal's *Budget Details*, and the cost for this Government Co-I is to be listed on line 4, "Other Applicable Costs," of the *Budget Summary*. If the proposal is selected, NASA will execute an inter- or intra-Agency funds transfer, as appropriate, to cover the cost of the Government Co-I. Conversely, if a Government PI institution teams with a private sector Co-I institution, that Government institution is expected to cover such Co-I costs through a subcontract that they execute. Therefore, such private sector Co-I costs should be entered on line 2.a, "Subcontracts," on the *Budget Summary*.

(iii) The proposing (PI) institution must subcontract the funding of all proposal Co-I's who reside at other institutions (except for a Government Co-I for a private sector PI as noted above) unless specifically noted otherwise as a special provision in Appendix A; that is, NASA will not separately make awards to Co-I's at distributed institutions regardless of the cost impact to the PI proposal for the management of such subcontracts.

(iv) In addition to the *Budget Summary* and in accordance with the *Instructions for Budget Summary* given in Section C.6 of this Appendix, the proposing institution must append at the end of the proposal sufficient details in narrative format to allow a full understanding of the budget. The proposing institution may also append the proposed budget in the format of their choice and without page limit.

(v) NASA is expected to be operating on the basis of full cost accounting as soon as possible, including all Civil Service salaries with overhead. In the interim period, proposals involving NASA and JPL employees as either a PI or as a Co-I should use the accounting method authorized at their institutions at the time proposals are due and for the entire proposed period of performance.

- *Reprints/Preprints*

Unless otherwise specified in Appendix A, a maximum of two reprints and/or preprints for peer-reviewed publication that are considered critical to understanding the background of the proposal may be appended to the proposal. However, even if such items are appended, NASA's peer reviewers are directed to base their judgments of the merits of the proposal only on its *Scientific/Technical/Management Section* and other related parts as described above in this section.

## C.6 Forms and Certifications

The following pages contain:

(i) the *Budget Summary* format and *Instructions for Budget Summary* (Note: a reasonable facsimile of the *Budget Summary* may be generated by the proposer for

submission or the electronic form may be downloaded from the Web site that contains this NRA); and

(ii) copies of the three *Certifications* currently required by U.S. Code (Note: these individual *Certifications* are included for reference only and should not be signed and returned; language is now included on the proposal *Cover Page* that confirms that these certification requirements are met once the printed copy of the *Cover Page* is signed by the Authorizing Institutional Representative and submitted with the proposal).

**BUDGET SUMMARY for RESEARCH PROPOSAL**

For (check one):

\_\_\_ **Total Period of Performance from (M/D/Y) \_\_\_\_\_ to \_\_\_\_\_**

\_\_\_ **For Year \_\_\_ of \_\_\_ from (M/D/Y) \_\_\_\_\_ to \_\_\_\_\_**

	A	<u>  NASA USE ONLY  </u>	
		B	C
1. <u>Direct Labor</u> (salaries, wages, and fringe benefits)	_____	_____	_____
2. <u>Other Direct Costs</u> :			
a. Subcontracts	_____	_____	_____
b. Consultants	_____	_____	_____
c. Equipment	_____	_____	_____
d. Supplies	_____	_____	_____
e. Travel	_____	_____	_____
f. Other	_____	_____	_____
3. <u>Facilities and Administrative Costs</u>	_____	_____	_____
4. <u>Other Applicable Costs</u> :	_____	_____	_____
5. <u>SUBTOTAL--Estimated Costs</u>	_____	_____	_____
6. <u>Less Proposed Cost Sharing</u> (if any)	_____	_____	_____
7. <u>Carryover Funds</u> (if any)			
a. Anticipated amount : _____			
b. Amount used to reduce budget	_____	_____	_____
8. <u>Total Estimated Costs</u>	_____	_____	XXXXXXXX
9. <u>APPROVED BUDGET</u>	XXXXXXX	XXXXXXX	_____

## **INSTRUCTIONS FOR BUDGET SUMMARY**

- Provide a complete Budget Summary (which may include an optional Education/Public Outreach effort) for the total as well as each individual year of the proposed period of performance.
  - Enter the proposed estimated costs in Column A (Columns B & C for NASA use only).
  - Provide, as attachments, detailed computations of all estimates in each cost category with narratives as required to fully explain each proposed cost as follows.
1. Direct Labor (salaries, wages, and fringe benefits): Attachments should list the number and titles of personnel, amounts of time to be devoted to the grant, and rates of pay.
  2. Other Direct Costs:
    - a. Subcontracts: Attachments should describe the work to be subcontracted, estimated amount, recipient (if known), and the reason for subcontracting.
    - b. Consultants: Identify consultants to be used, why they are necessary, the time they will spend on the project, and rates of pay (not to exceed the equivalent of the daily rate for Level IV of the Executive Schedule, exclusive of expenses and indirect costs).
    - c. Equipment: List separately. Explain the need for items costing more than \$5,000. Describe basis for estimated cost. General purpose equipment is not allowable as a direct cost unless specifically approved by the NASA Grant Officer. Any equipment purchase requested to be made as a direct charge under this award must include the equipment description, how it will be used in the conduct of the basic research proposed and why it cannot be purchased with indirect funds.
    - d. Supplies: Provide general categories of needed supplies, the method of acquisition, and the estimated cost.
    - e. Travel: Describe the purpose of the proposed travel in relation to the grant and provide the basis of estimate, including information on destination and number of travelers where known.
    - f. Other: Enter the total of direct costs not covered by 2a through 2e. Attach an itemized list explaining the need for each item and the basis for the estimate.
  3. Facilities and Administrative (F&A) Costs: Identify F&A cost rate(s) and base(s) as approved by the cognizant Federal agency, including the effective period of the rate. Provide the name, address, and telephone number of the Federal agency official having cognizance. If unapproved rates are used, explain why, and include the computational basis for the indirect expense pool and corresponding allocation base for each rate.
  4. Other Applicable Costs: Enter total explaining the need for each item.
  5. Subtotal-Estimated Costs: Enter the sum of items 1 through 4.
  6. Less Proposed Cost Sharing (if any): Enter any amount proposed. If cost sharing is based on specific cost items, identify each item and amount in an attachment.
  7. Carryover Funds (if any): Enter the dollar amount of any funds expected to be available for carryover from the prior budget period. Identify how the funds will be used if they are not used to reduce the budget. NASA officials will decide whether to use all or part of the anticipated carryover to reduce the budget (not applicable to 2nd-year and subsequent-year budgets submitted for award of a multiple year award).
- Total Estimated Costs: Enter the total after subtracting items 6 and 7b from item 5.

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**Certification Regarding Debarment, Suspension, and  
Other Responsibility Matters**

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This certification is required by the regulations implementing Executive Order 12549, Debarment and Suspension, 34 CFR Part 85, Section 85.510, Participant's responsibilities. The regulations were published as Part VII of the May 26, 1988 Federal Register (pages 19160-19211).

2. The prospective primary participant certifies to the best of its knowledge and belief, that it and its principals:
  3. Are not presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from covered transactions by any Federal department or agency;
  4. Have not within a three-year period preceding this proposal been convicted of or had a civil judgment rendered against them for commission of fraud or a criminal offense in connection with obtaining, attempting to obtain, or performing a public (Federal, State, or local) transaction or contract under a public transaction; violation of Federal or State antitrust statutes or commission of embezzlement theft, forgery, bribery, falsification or destruction of records, making false statements, or receiving stolen property;
  5. Are not presently indicted for or otherwise criminally or civilly charged by a governmental entity (Federal, State or local) with commission of any of the offenses enumerated in paragraph (1)(b) of this certification; and
  6. Have not within three-year period preceding this application/proposal had one or more public transactions (Federal, State, or local) terminated for cause or default.
- (2) Where the prospective primary participant is unable to certify to any of the statements in this certification, such prospective participant shall attach an explanation to this proposal.

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### **Certification Regarding Lobbying**

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- (1) No Federal appropriated funds have been paid or will be paid, by or on behalf of the undersigned, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with the awarding of any Federal contract, the making of any Federal grant, the making of any Federal loan, the entering into of any cooperative agreement, and the extension, continuation, renewal, amendment, or modification of any Federal contract, grant, loan, or cooperative agreement.
- (2) If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of Congress, or an employee of a Member of Congress in connection with this Federal contract, grant, loan, or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, "Disclosure Form to Report Lobbying," in accordance with its instructions.
- (3) The undersigned shall require that the language of this certification be included in the award documents for all subawards at all tiers (including subcontracts, subgrants, and contracts under grants, loans, and cooperative agreements) and that all subrecipients shall certify and disclose accordingly.

This certification is a material representation of fact upon which reliance was placed when this transaction was made or entered into. Submission of this certification is a prerequisite for making or entering into this transaction imposed by section 1352, title 31, U.S. Code. Any person who fails to file the required certification shall be subject to a civil penalty of not less than \$10,000, and not more than \$100,000 for each such failure.

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**Certification of Compliance with the NASA Regulations Pursuant to  
Nondiscrimination in Federally Assisted Programs**

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The (*Institution, corporation, firm, or other organization on whose behalf this assurance is signed, hereinafter called "Applicant "*) hereby agrees that it will comply with Title VI of the Civil Rights Act of 1964 (P.L. 88-352), Title IX of the Education Amendments of 1962 (20 U.S.C. 1680 et seq.), Section 504 of the Rehabilitation Act of 1973, as amended (29 U.S.C. 794), and the Age Discrimination Act of 1975 (42 U.S.C. 16101 et seq.), and all requirements imposed by or pursuant to the Regulation of the National Aeronautics and Space Administration (14 CFR Part 1250) (hereinafter called "NASA") issued pursuant to these laws, to the end that in accordance with these laws and regulations, no person in the United States shall, on the basis of race, color, national origin, sex, handicapped condition, or age be excluded from participation in, be denied the benefits of, or be otherwise subjected to discrimination under any program or activity for which the Applicant receives federal financial assistance from NASA; and hereby give assurance that it will immediately take any measure necessary to effectuate this agreement.

If any real property or structure thereon is provided or improved with the aid of federal financial assistance extended to the Applicant by NASA, this assurance shall obligate the Applicant, or in the case of any transfer of such property, any transferee, for the period during which the real property or structure is used for a purpose for which the federal financial assistance is extended or for another purpose involving the provision of similar services or benefits. If any personal property is so provided, this assurance shall obligate the Applicant for the period during which the federal financial assistance is extended to it by NASA.

This assurance is given in consideration of and for the purpose of obtaining any and all federal grants, loans, contracts, property, discounts, or other federal financial assistance extended after the date hereof to the Applicant by NASA, including installment payments after such date on account of applications for federal financial assistance which were approved before such date. The Applicant recognized and agrees that such federal financial assistance will be extended in reliance on the representations and agreements made in this assurance, and that the United States shall have the right to seek judicial enforcement of this assurance. This assurance is binding on the Applicant, its successors, transferees, and assignees, and the person or persons whose signatures appear below are authorized to sign on behalf of the Applicant.